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ABSTRACT

The measurement is carried out by means of the Ecole Polytechnique 1 m heavy liquid bubble chamber irradiated by 800 MeV/c K^+ beam. The charged-to-neutral branching ratio turned out to be $2,12 \pm 0,17$.

The K_s decay branching ratio was determined with the Ecole Polytechnique heavy liquid bubble chamber /BP3/, 100x50x50 cm^3 in volume, filled with a mixture of propane and freon /55% C_3H_5, 45% CF_3Br/ having a radiation length of 22 cm. The chamber was operated in a magnetic field of 17.5 kGauss and irradiated by the 800 MeV/c K^+- beam of the CERN proton synchrotron.* We should like to present here the preliminary results of our experiment.

More than 20 000 photographs were scanned for the charge exchange of the primary K^+ giving rise to K^o decaying into two pions. The $K_s \to \pi^+\pi^-$ and $K_s \to \pi^o\pi^o$ decay modes were recognized by observation of V events, and that of 3 or 4 materialized γ rays having common origin, respectively. The pictures were scanned at least twice by different scanners. Pictures with more than 15 primary tracks were rejected. Measurements were carried out by means of digitized microscopes.

To be included in our sample, the charge exchange events had to satisfy the following criteria:

1/ The deviation of the direction of the incoming K^+ from the average direction of the beam is less than 12^o, and no scattering is visible on its track in the chamber.

2/ All secondary tracks from the interaction are stopped inside the chamber without decaying or interacting.

For selecting $K_s \to \pi^+\pi^-$ events the following criteria were applied:

1/ The K_s decay is inside a certain fiducial volume of the chamber and directed into a charge exchange event /coplanarity condition/.

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*The π^+ contamination of the beam was about 1% [1].

2/ The flight path of the K_s is greater than 0.4 cm and less than 10 cm.

3/ The range of charged pions given rise in the K_s decay is at least 0.5 cm in the chamber.

$K_s \to \pi^o\pi^o$ events were included in our sample if they satisfied the following criteria:

1/ 3 or 4 electron pairs were found, each having total track lenght $\geq$ 2 cm.

2/ All γ rays have one common origin in the fiducial volume. For checking this first the three views were investigated separately and the existence of a common point of the projected trajectories was tested on each stereophotograph. If such common point was found on each view /confidence level: 99%/, the spatial reconstruction of the common origin was carried out by means of the usual method with lightrays. Evens were rejected if the lightray fit gave $\leq$ 1% probability. The latter value was chosen relatively low because a separate correction was made later for the most important background, reactions /1/ and /2/.

In this computation special care was taken for the elimination of Bremsstrahlung γ's . γ particles accompanying the "primary" γ's given rise by the decay of the π^o were considered as Bermsstrahlung γ's if they were deflected on each stereoview by less than 15^o as compared to the direction of the "primary" γ.

The number of the $K_s \to \pi^+\pi^-$ and $K_s \to \pi^o\pi^o$ decays was evaluated using the maximum likelihood method /MLM/ and applying certain corrections.

The number of $K_s \to \pi^+\pi^-$ events was obtained by means of a MLM calculation taking into account the following effects:

1/ The scanning efficiency for finding $K_s \to \pi^+\pi^-$ events satisfying the selection criteria discussed above.

2/ The measuring efficiency of selected events.

3/ Background events satisfying the coplanarity condition.

The number of charged decays resulting from the MLM calculation was corrected for:

1/ Events with decay length less than 0.4 cm or greater than 10 cm.

2/ K_s decays having a pion secondary which stops or interacts in a distance less than 0.5 cm.

Both correction factors were obtained by Monte Carlo /MC/ calculation.

The number of $K_s \to \pi^o\pi^o$ events was obtained also by means of a MLM calculation taking into account the following effects :

1/ The scanning efficiency for finding $K_s \to \pi^o\pi^o$ satisfying the selection criteria already discussed.

2/ The measuring efficiency of selected events.

The number of neutral decays thus obtained was corrected for:

1/ Decays where the number of materialized γ rays in the chamber was only 0, 1 or 2.

2/ Electron pairs having total track length less than 2 cm.

3/ Events where "primary" γ's were taken as Bremsstrahlung γ rays due to our selection criteria and thus excluded from the sample. The above correction factors were calculated by MC method.

4/ Background events given rise by the reactions

$$K^+N \to K^o\pi^oN' \qquad /1/$$

$$\pi^+N \to \pi^o\pi^oN' \qquad /2/$$

The number of charged and neutral K_s decays observed directly using the selection criteria discussed above, and the corresponding numbers obtained using the MLM calculation and corrections are compiled in the Table.

TABLE

Number of charged and neutral K_s decay

Decay mode	Observed	Corrected
$K_s \to \pi^+\pi^-$	1371	1795 $\pm$ 62
$K_s \to \pi^o\pi^o$	267	845 $\pm$ 60

The value of the charged-to-neutral decay branching ratio of K_s turns out to be

$$\frac{\Gamma\left(K_s \to \pi^+\pi^-\right)}{\Gamma\left(K_s \to \pi^o\pi^o\right)} = 2{,}12 \pm 0{,}17 \qquad /3/$$

This value can be compared with the results of other experiments [2-6]. Due to the relatively large error of our preliminary result, no conclusion can be drawn from it concerning the validity of the $|\Delta I| = \frac{1}{2}$ rule. Further measurements are in progress in order to increase the accuracy of our result.

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